

# MC14572UB

## Hex Gate

The MC14572UB hex functional gate is constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. These complementary MOS logic gates find primary use where low power dissipation and/or high noise immunity is desired. The chip contains four inverters, one NOR gate and one NAND gate.

### Features

- Diode Protection on All Inputs
- Single Supply Operation
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- NOR Input Pin Adjacent to  $V_{SS}$  Pin to Simplify Use As An Inverter
- NAND Input Pin Adjacent to  $V_{DD}$  Pin to Simplify Use As An Inverter
- NOR Output Pin Adjacent to Inverter Input Pin For OR Application
- NAND Output Pin Adjacent to Inverter Input Pin For AND Application
- Capable of Driving Two Low-Power TTL Loads or One Low-Power Schottky TTL Load over the Rated Temperature Range
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS (Voltages Referenced to $V_{SS}$ )

Parameter	Symbol	Value	Unit
DC Supply Voltage Range	$V_{DD}$	-0.5 to +18.0	V
Input or Output Voltage Range (DC or Transient)	$V_{in}, V_{out}$	-0.5 to $V_{DD}$ + 0.5	V
Input or Output Current (DC or Transient) per Pin	$I_{in}, I_{out}$	±10	mA
Power Dissipation, per Package (Note 1)	$P_D$	500	mW
Ambient Temperature Range	$T_A$	-55 to +125	°C
Storage Temperature Range	$T_{stg}$	-65 to +150	°C
Lead Temperature (8-Second Soldering)	$T_L$	260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Temperature Derating: Plastic "P and D/DW"  
Packages: - 7.0 mW/°C From 65°C To 125°C

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation,  $V_{in}$  and  $V_{out}$  should be constrained to the range  $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$ .

Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $V_{SS}$  or  $V_{DD}$ ). Unused outputs must be left open.

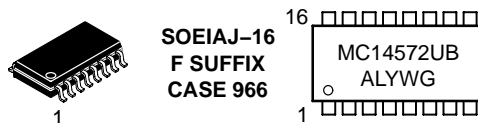
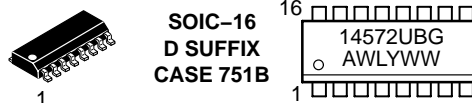
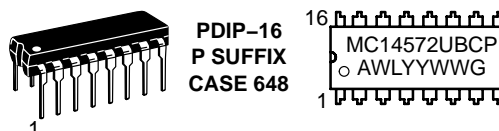
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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### MARKING DIAGRAMS



A = Assembly Location  
WL, L = Wafer Lot  
YY, Y = Year  
WW, W = Work Week  
G = Pb-Free Package

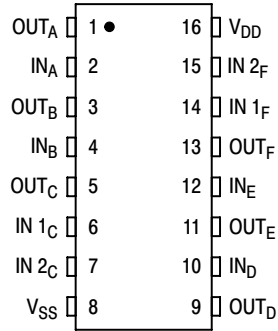
### ORDERING INFORMATION

Device	Package	Shipping†
MC14572UBCP	PDIP-16	25 Units / Rail
MC14572UBCPG	PDIP-16 (Pb-Free)	25 Units / Rail
MC14572UBD	SOIC-16	48 Units / Rail
MC14572UBDG	SOIC-16 (Pb-Free)	48 Units / Rail
MC14572UBDR2	SOIC-16	2500/Tape & Reel
MC14572UBDR2G	SOIC-16 (Pb-Free)	2500/Tape & Reel
MC14572UBF	SOEIAJ-16	50 Units / Rail

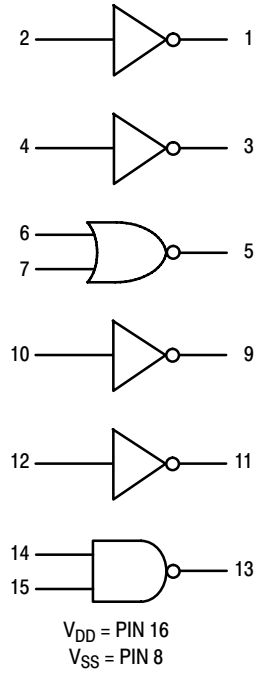
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MC14572UB

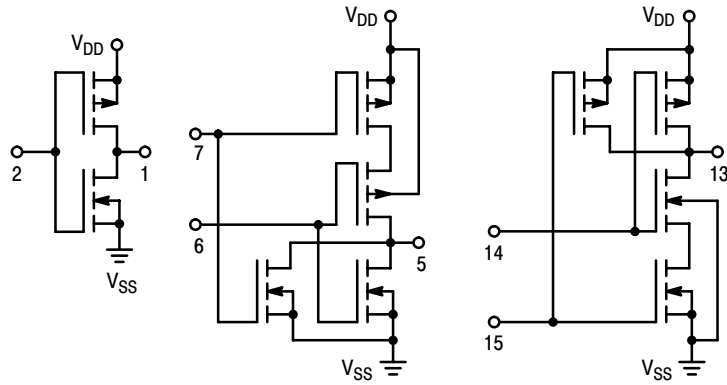
## PIN ASSIGNMENT



## LOGIC DIAGRAM



## CIRCUIT SCHEMATIC



# MC14572UB

## ELECTRICAL CHARACTERISTICS (Voltages Referenced to $V_{SS}$ )

Characteristic	Symbol	$V_{DD}$ Vdc	- 55°C		25°C			125°C		Unit	
			Min	Max	Min	Typ (Note 2)	Max	Min	Max		
Output Voltage $V_{in} = V_{DD}$ or 0  $V_{in} = 0$ or $V_{DD}$	“0” Level   “1” Level	$V_{OL}$	5.0	–	0.05	–	0	0.05	–	0.05	Vdc
			10	–	0.05	–	0	0.05	–	0.05	
15			–	0.05	–	0	0.05	–	0.05		
	$V_{OH}$	5.0	4.95	–	4.95	5.0	–	4.95	–	Vdc	
		10	9.95	–	9.95	10	–	9.95	–		
		15	14.95	–	14.95	15	–	14.95	–		
Input Voltage ( $V_O = 4.5$ or $0.5$ Vdc) ( $V_O = 9.0$ or $1.0$ Vdc) ( $V_O = 13.5$ or $1.5$ Vdc)  ( $V_O = 0.5$ or $4.5$ Vdc) ( $V_O = 1.0$ or $9.0$ Vdc) ( $V_O = 1.5$ or $13.5$ Vdc)	“0” Level   “1” Level	$V_{IL}$	5.0	–	1.0	–	2.25	1.0	–	1.0	Vdc
				10	–	2.0	–	4.50	2.0	–	
			15	–	2.5	–	6.75	2.5	–	2.5	
	$V_{IH}$	5.0	4.0	–	4.0	2.75	–	4.0	–	Vdc	
		10	8.0	–	8.0	5.50	–	8.0	–		
		15	12.5	–	12.5	8.25	–	12.5	–		
Output Drive Current ( $V_{OH} = 2.5$ Vdc) ( $V_{OH} = 4.6$ Vdc) ( $V_{OH} = 9.5$ Vdc) ( $V_{OH} = 13.5$ Vdc)  ( $V_{OL} = 0.4$ Vdc) ( $V_{OL} = 0.5$ Vdc) ( $V_{OL} = 1.5$ Vdc)	Source	$I_{OH}$	5.0	–1.2	–	–1.0	–1.7	–	–0.7	–	mAdc
				5.0	–0.25	–	–0.2	–0.36	–	–0.14	
			10	–0.62	–	–0.5	–0.9	–	–0.35	–	
		15	–1.8	–	–1.5	–3.5	–	–1.1	–		
	Sink	$I_{OL}$	5.0	0.64	–	0.51	0.88	–	0.36	–	mAdc
			10	1.6	–	1.3	2.25	–	0.9	–	
			15	4.2	–	3.4	8.8	–	2.4	–	
Input Current	$I_{in}$	15	–	$\pm 0.1$	–	$\pm 0.00001$	$\pm 0.1$	–	$\pm 1.0$	$\mu$ Adc	
Input Capacitance ( $V_{in} = 0$ )	$C_{in}$	–	–	–	–	5.0	7.5	–	–	pF	
Quiescent Current (Per Package)	$I_{DD}$	5.0	–	0.25	–	0.0005	0.25	–	7.5	$\mu$ Adc	
		10	–	0.5	–	0.0010	0.5	–	15		
		15	–	1.0	–	0.0015	1.0	–	30		
Total Supply Current (Notes 3, 4) (Dynamic plus Quiescent, Per Package) ( $C_L = 50$ pF on all outputs, all buffers switching)	$I_T$	5.0 10 15	$I_T = (1.89 \mu\text{A/kHz}) f + I_{DD}$ $I_T = (3.80 \mu\text{A/kHz}) f + I_{DD}$ $I_T = (5.68 \mu\text{A/kHz}) f + I_{DD}$							$\mu$ Adc	

2. Data labelled “Typ” is not to be used for design purposes but is intended as an indication of the IC’s potential performance.

3. The formulas given are for the typical characteristics only at 25°C.

4. To calculate total supply current at loads other than 50 pF:  $I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) V f k$  where:  $I_T$  is in  $\mu\text{A}$  (per package),  $C_L$  in pF,  $V = (V_{DD} - V_{SS})$  in volts,  $f$  in kHz is input frequency, and  $k = 0.006$ .

# MC14572UB

## SWITCHING CHARACTERISTICS (Type 5) ( $C_L = 50 \text{ pF}$ , $T_A = 25^\circ\text{C}$ )

Characteristic	Symbol	$V_{DD}$	Min	Typ (Note 6)	Max	Unit
Output Rise Time $t_{TLH} = (3.0 \text{ ns/pF}) C_L + 30 \text{ ns}$ $t_{TLH} = (1.5 \text{ ns/pF}) C_L + 15 \text{ ns}$ $t_{TLH} = (1.1 \text{ ns/pF}) C_L + 10 \text{ ns}$	$t_{TLH}$	5.0 10 15	– – –	180 90 65	360 180 130	ns
Output Fall Time $t_{THL} = (1.5 \text{ ns/pF}) C_L + 25 \text{ ns}$ $t_{THL} = (0.75 \text{ ns/pF}) C_L + 12.5 \text{ ns}$ $t_{THL} = (0.55 \text{ ns/pF}) C_L + 9.5 \text{ ns}$	$t_{THL}$	5.0 10 15	– – –	100 50 40	200 100 80	ns
Propagation Delay Time $t_{PLH}, t_{PHL} = (1.7 \text{ ns/pF}) C_L + 5 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.66 \text{ ns/pF}) C_L + 17 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 15 \text{ ns}$	$t_{PLH}, t_{PHL}$	5.0 10 15	– – –	90 50 40	180 100 80	ns

5. The formulas given are for the typical characteristics only at  $25^\circ\text{C}$ .

6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

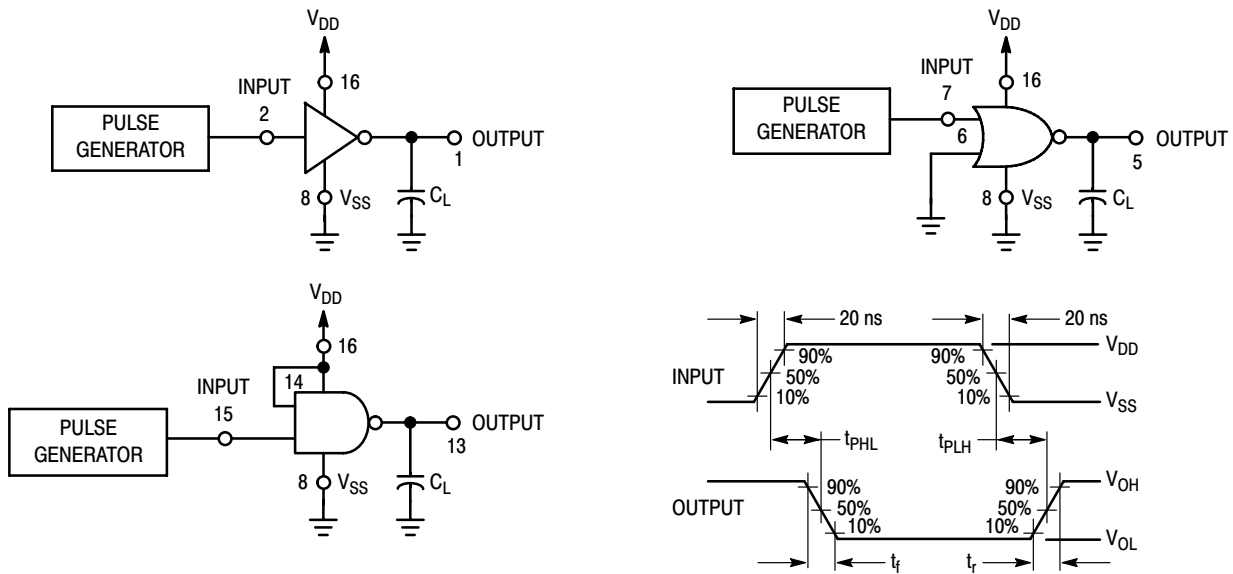
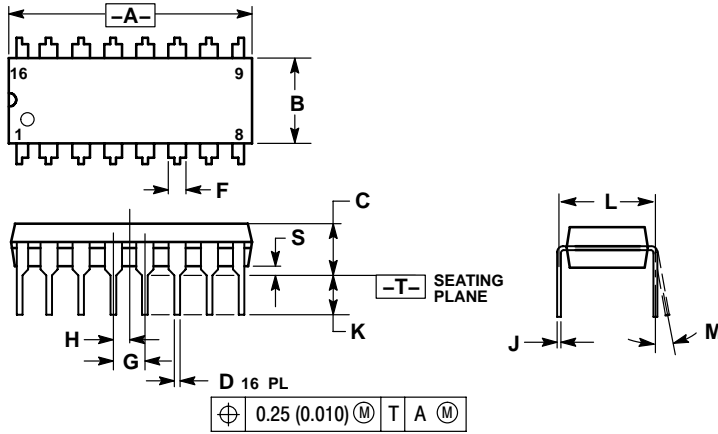


Figure 1. Switching Time Test Circuits and Waveforms

# MC14572UB

## PACKAGE DIMENSIONS

PDIP-16  
CASE 648-08  
ISSUE T

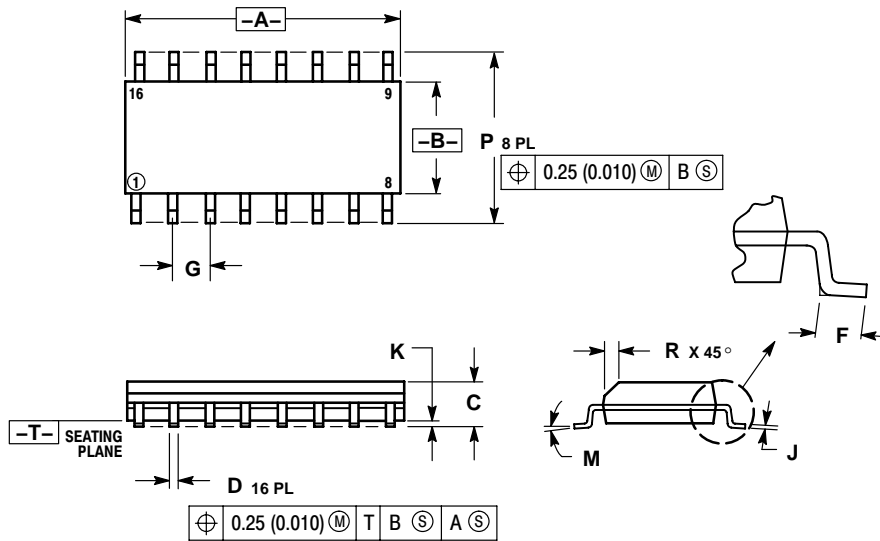


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

SOIC-16  
CASE 751B-05  
ISSUE J



NOTES:

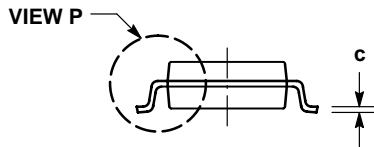
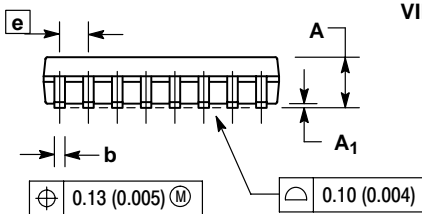
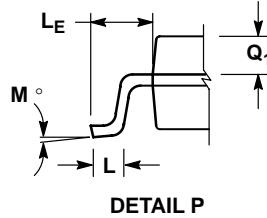
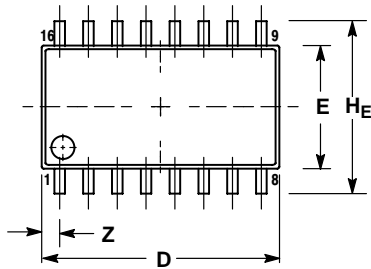
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

# MC14572UB

## PACKAGE DIMENSIONS

SOEIAJ-16  
CASE 966-01  
ISSUE A



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A <sub>1</sub>	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.10	0.20	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H <sub>E</sub>	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L <sub>E</sub>	1.10	1.50	0.043	0.059
M	0°	10°	0°	10°
Q <sub>1</sub>	0.70	0.90	0.028	0.035
Z	---	0.78	---	0.031

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